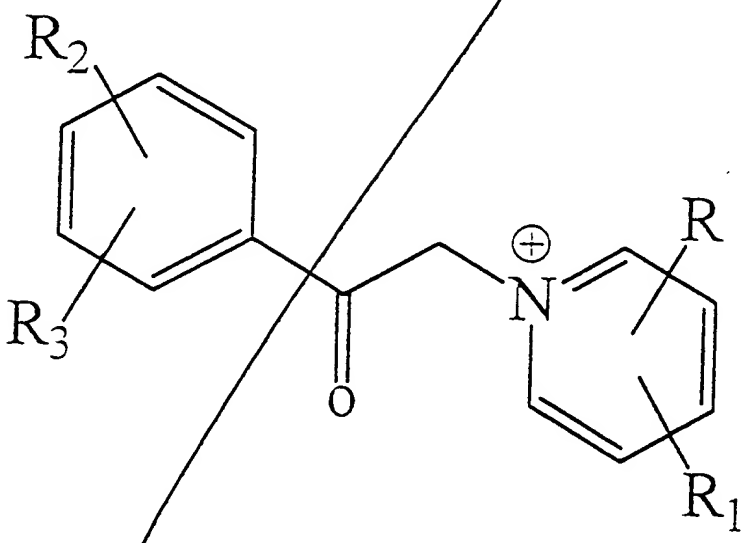
We claim:

1. An ischemia-damage mitigating compound having a formula I:



I

wherein R and R_1 are independently hydrogen, sulfamide, carboxyamide, cyano, straight or branched C_{1-6} alkyl, straight or branched C_{2-6} alkenyl, straight or branched C_{1-6} alkoxy, a straight chain C_{1-6} alkyl or a straight chain C_{2-6} alkenyl having an ether link or an ester link, toluenyl, COOH, nitrate, or halide (Br, Cl, I, F), wherein both R and R_1 cannot be hydrogen, wherein R_2 and R_3 are independently hydrogen, sulfamide, carboxyamide, cyano, straight or branched C_{1-6} alkyl, straight or branched C_{2-6} alkenyl, straight or branched C_{1-6} alkoxy, a straight chain C_{1-6} alkyl or a straight chain C_{2-6} alkenyl having an ether link or an ester link, toluenyl, COOH, nitrate, or halide (~~Br, Cl, I, F~~).

2. The ischemia-damage mitigating compound of claim 1 wherein R and R_1 are meta to each other and to the heteroatom.

~~3. The ischemia-damage mitigating compound of claim 1 wherein R is COOH.~~

~~4. The ischemia-damage mitigating compound of claim 1 wherein R_1 is COOH.~~

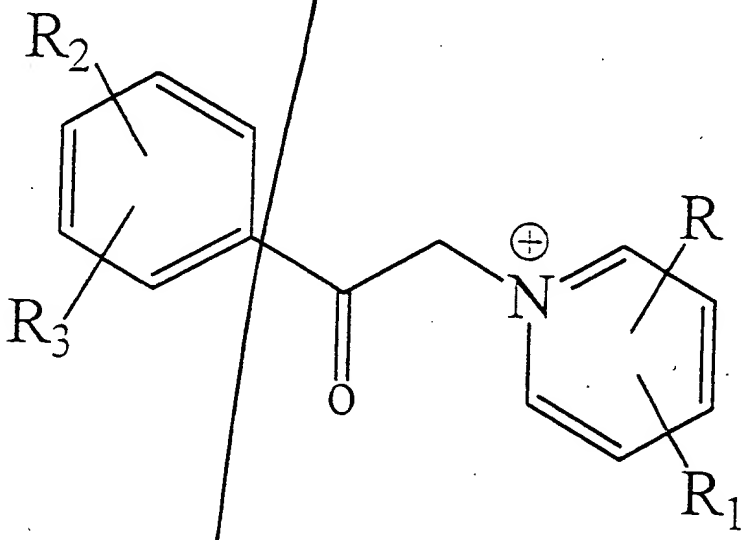
5. The ischemia-damage mitigating compound of claim 1 wherein R_2 and R_3 are both hydrogen.

6. The ischemia-damage mitigating compound of claim 1 wherein R and R_1 are each COOH, and R_2 and R_3 are both hydrogen.

7. The ischemia-damage mitigating compound of claim 1 wherein the compound is selected from the group consisting of 1-phenacyl-2,3-dicarboxypyrdinium bromide; 1-phenacyl-2,4-dicarboxypyrdinium bromide; 1-phenacyl-2,5-dicarboxypyrdinium bromide (AP5); 1-

phenacyl-2,6-dicarboxypyrdinium bromide; 1-phenacyl-2,3-dicarboxyimidepyrdinium bromide; 1-phenacyl-2,4-dicarboxyimidepyrdinium bromide; 1-phenacyl-2,5-dicarboxyimidepyrdinium bromide; and 1-phenacyl-2,6-dicarboxyimidepyrdinium bromide.

8. A pharmaceutical composition comprising a compound from formula I in a pharmaceutically acceptable carrier, wherein formula I comprises:



I

wherein R and R_1 are independently hydrogen, sulfamide, carboxyamide, cyano, straight or branched C_{1-6} alkyl, straight or branched C_{2-6} alkenyl, straight or branched C_{1-6} alkoxy, a straight chain C_{1-6} alkyl or a straight chain C_{2-6} alkenyl having an ether link or an ester link, toluenyl, COOH, nitrate, or halide (Br, Cl, I, F), wherein both R and R_1 cannot be hydrogen, wherein R_2 and R_3 are independently hydrogen, sulfamide, carboxyamide, cyano, straight or branched C_{1-6} alkyl, straight or branched C_{2-6} alkenyl, straight or branched C_{1-6} alkoxy, a straight chain C_{1-6} alkyl or a straight chain C_{2-6} alkenyl having an ether link or an ester link, toluenyl, COOH, nitrate, or halide (~~Br~~, Cl, I, F).

9. The pharmaceutical composition of claim 8 wherein R and R_1 are meta to each other and to the heteroatom.

10. The pharmaceutical composition of claim 8 wherein R is COOH.

11. The pharmaceutical composition of claim 8 wherein R_1 is COOH.

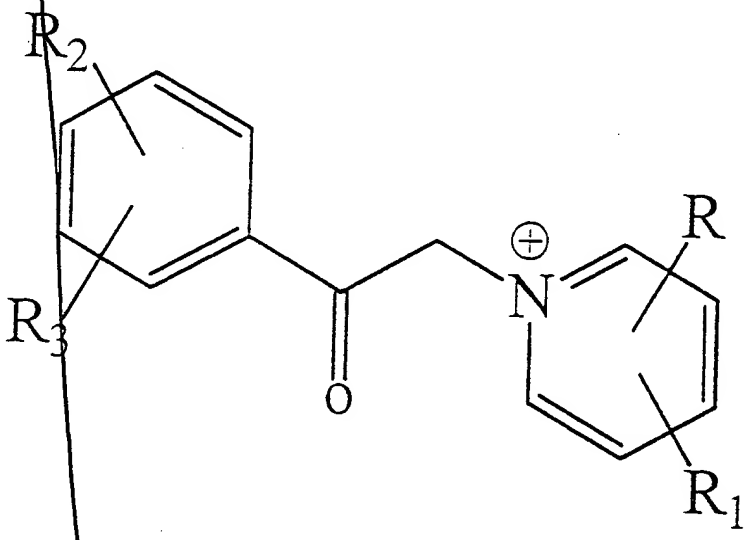
12. The pharmaceutical composition of claim 8 wherein R_2 and R_3 are both hydrogen.

13. The pharmaceutical composition of claim 8 wherein R and R_1 are each COOH, and R_2 and R_3 are both hydrogen.

40

14. The pharmaceutical composition of claim 8 wherein the compound is selected from the group consisting of 1-phenacyl-2,3-dicarboxypyrdinium bromide; 1-phenacyl-2,4-dicarboxypyrdinium bromide; 1-phenacyl-2,5-dicarboxypyrdinium bromide (AP5); 1-phenacyl-2,6-dicarboxypyrdinium bromide; 1-phenacyl-2,3-dicarboxyimidepyrdinium bromide; 1-phenacyl-2,4-dicarboxyimidepyrdinium bromide; 1-phenacyl-2,5-dicarboxyimidepyrdinium bromide; and 1-phenacyl-2,6-dicarboxyimidepyrdinium bromide.

15. A method for inhibiting tissue damage caused by ischemia, comprising administering an effective amount of a compound of formula I, wherein formula I comprises:



I

wherein R and R_1 are independently hydrogen, sulfamide, carboxyamide, cyano, straight or branched C_{1-6} alkyl, straight or branched C_{2-6} alkenyl, straight or branched C_{1-6} alkoxy, a straight chain C_{1-6} alkyl or a straight chain C_{2-6} alkenyl having an ether link or an ester link, toluenyl, COOH, nitrate, or halide (Br, Cl, I, F), wherein both R and R_1 cannot be hydrogen, wherein R_2 and R_3 are independently hydrogen, sulfamide, carboxyamide, cyano, straight or branched C_{1-6} alkyl, straight or branched C_{2-6} alkenyl, straight or branched C_{1-6} alkoxy, a straight chain C_{1-6} alkyl or a ~~straight chain C_{2-6} alkenyl having an ether link or an ester link, toluenyl, COOH, nitrate, or halide (Br, Cl, I, F).~~

16. The method of claim 15 wherein R and R_1 are meta to each other and to the heteroatom.

17. The method of claim 15 wherein R is COOH.

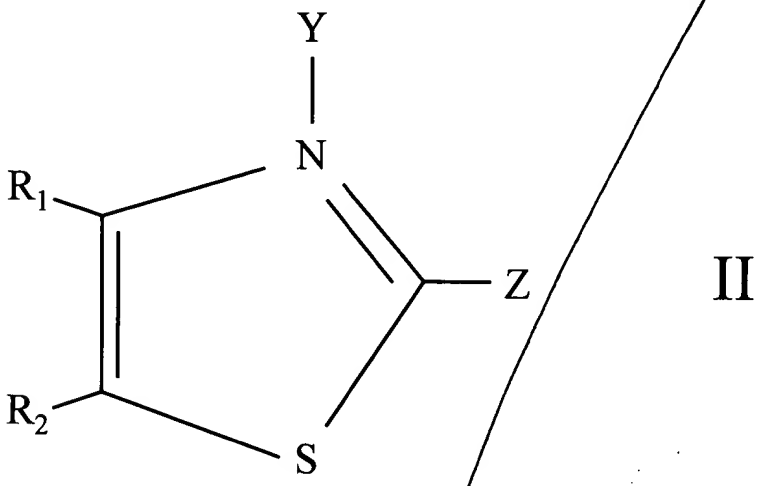
18. The method of claim 15 wherein R_1 is COOH.

19. The method of claim 15 wherein R_2 and R_3 are both hydrogen.

20. The method of claim 15 wherein R and R_1 are each COOH, and R_2 and R_3 are both hydrogen.

21. The method of claim 15 wherein the compound is selected from the group consisting of 1-phenacyl-2,3-dicarboxypyrdinium bromide; 1-phenacyl-2,4-dicarboxypyrdinium bromide; 1-phenacyl-2,5-dicarboxypyrdinium bromide (AP5); 1-phenacyl-2,6-dicarboxypyrdinium bromide; 1-phenacyl-2,3-dicarboxyimidepyrdinium bromide; 1-phenacyl-2,4-dicarboxyimidepyrdinium bromide; 1-phenacyl-2,5-dicarboxyimidepyrdinium bromide; and 1-phenacyl-2,6-dicarboxyimidepyrdinium bromide.

22. A method for inhibiting tissue damage caused by ischemia, comprising administering an effective amount of a compound of formula II, wherein formula II comprises:



II

wherein R_1 and R_2 are independently selected from the group consisting of hydrogen, hydroxy C_{1-6} alkyl, C_{1-6} alkoxy C_{1-6} alkyl, and R_1 and R_2 together with their ring carbons may be an aromatic fused ring; wherein Z is hydrogen or an amino group; wherein Y is hydrogen or a group of the formula $-CH_2COR$; wherein R is C_{1-6} alkyl, C_{1-6} alkoxy, hydroxy, amino, aryl, or $-CH_2R_3$ wherein R_3 is H, C_{1-6} alkyl, C_{2-6} alkenyl, or C_{4-6} aryl.

23. The method of claim 22 wherein the compound of formula II is a halide (Cl, Br, F or I), tosylate, methanesulfonate or mesitylene sulfonate salt.

24. A method for treating tissue damage caused by ischemia, comprising administering an effective amount of a compound that detoxifies 3-aminopropanal.

25. The method of claim 24 wherein the tissue damage resulting from ischemia are manifest as myocardial infarction or stroke.

26. An *in vivo* screening assay comprising administering a polyamine compound or 3-aminopropanal into the brain parenchyma of a test animal by microinjection, administering a test

compound or control agent locally or systemically, and measuring cytotoxicity in stained brain sections from the test animals.

27. An *in vitro* screening assay comprising exposing cultured glial cells or neuronal cells related cell lines to 3-aminopropanal at a concentration of from about 50 to about 1000 μM, adding various concentrations of test compound or control media to the cell cultures, incubated under cell culture conditions for a period of from about 5 minutes to about 20 hours, and determining the percentage of cell viability.